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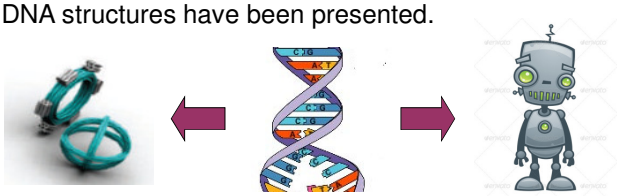
ABSTRACT

DNA based nanostructures and advances in DNA origami techniques have shown great potential in fabrication of nanostructures and devices. Though a large number of DNA origami structures have been reported, very few applications of DNA structures have been presented.



We are proposing to use DNA biostructures as a scaffold for nanoscale devices.

INTRODUCTION

- DNA nanostructures, combined with nanoparticles, have a potential to revolutionize nano-electronics.

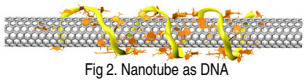


Fig 2. Nanotube as DNA Scaffold

- The focus of our research is to fabricate DNA scaffold based on nanoscale-antennas.

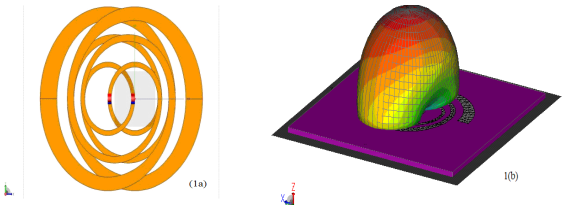


Fig. 1 nanostructure conformal patch antenna

PREVIOUS WORK

- The origami, folding of long single strand DNA with shorter staple strands, was first presented by (Rothemund 2006).
- Several DNA origami shapes have been reported.
- nanoCAD is used for modeling the behavior of DNA molecule.

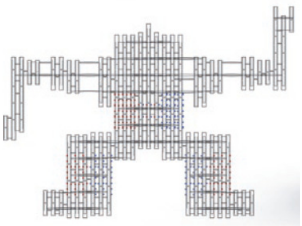


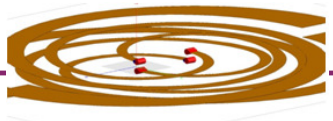
Fig 3 DNA Modeling with caDNAno

Protocol

- The origami's can be self-assembled by mixing M13mp18 scaffold DNA with staple strands in solution of MgCl2, Tris-HCl, EDTA and NaCl, as well as a specific intercalating dye whose fluorescence is enhanced when bound to double-stranded DNA.
- Long circular strand DNA from a M13mp18 virus and short staple strands cartridge-purified, oligos) can be bought commercially.
- The solution has to cool slowly in or peak force tapping mode. a PCR thermocycler (Polymerase Chain Reaction) and origami shapes can be imaged using FM (Atomic Force Microscopy) tapping.

NANO-SCALE ANTENNAE DESIGN

- Spiral Antenna: Frequency independent impedance and radiation pattern.
- Custom shapes formed by programmable DNA self-assembly can be used to engineer nanoscale devices such as a biological antenna.
- Conductivity of such a biological antenna can be achieved by using conductive nanoparticles coating on DNA or by attaching conducting polymers to DNA structures.
- Engineered nano-antennas have a resonant frequency, that can be used for diagnostic and drug delivery.



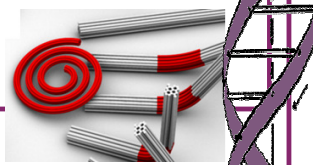


Fig. 4 210 x 240 nm Spiral Antenna Design

APPLICATION AND CONCLUSION

- The application of such nanostructures are in medicine, power harvesting & nanoelectronics.

Engineered nano-antennas have a resonant frequency, that can be used for advance diagnostic and drug delivery.

Nano-antennas are carriers that can be used in advanced detection systems a and nanotoxicology.

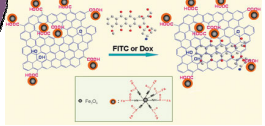


Fig. 5. Graphene Oxide Anticancer Drug Carrier

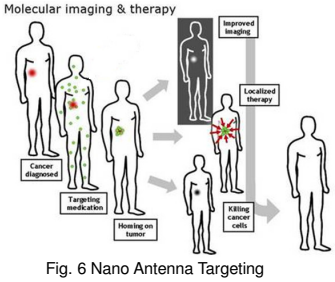


Fig. 6 Nano Antenna Targeting